

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

## SCHEME OF TEACHING & EXAMINATION

### BE (Biotechnology) III Semester

Sl. No.	Board of Study	Subject Code	Subject	Period per week			Scheme of Exam			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Biotechnology	318351(18)	Cellular and Molecular Biology	4	0	-	80	20	20	120	4
2	Biotechnology	318352(18)	Microbial Technology	4	0	-	80	20	20	120	4
3	Biotechnology	318353(18)	Molecular Dynamics and Bioenergetics	3	1	-	80	20	20	120	4
4	Applied Chemistry	318354(11)	Phytochemistry	3	1	-	80	20	20	120	4
5	Chemical Engineering	318355(19)	Stoichimetric Calculations	3	1	-	80	20	20	120	4
6	Chemical Engineering	318356(19)	Instrumentation Techniques	4	1	-	80	20	20	120	5
7	Biotechnology	318361(18)	Cellular and Molecular Biology Lab	-	-	3	40	-	20	60	2
8	Biotechnology	318362(18)	Microbial Technology Lab	-	-	3	40	-	20	60	2
9	Applied Chemistry	318363(11)	Phytochemistry Lab	-	-	3	40	-	20	60	2
10	Chemical Engineering	318364(19)	Instrumentation Techniques Lab	-	-	3	40	-	20	60	2
11	Humanities	318365(46)	Value Education	-	-	2	-	-	40	40	1
12			Library	-	-	1					
			<b>Total</b>	<b>21</b>	<b>4</b>	<b>15</b>	<b>640</b>	<b>120</b>	<b>240</b>	<b>1000</b>	<b>34</b>

*L: Lecture, T: Tutorial, P: Practical, ESE: End Semester Exam, CT: Class Test, TA: Teachers Assessment*

*Note: Duration of all theory papers will be of Three Hours.*

# Chhattisgarh Swami Vivekanand Technical University, Bilai

Name of program:	<b>Bachelor of Engineering</b>	Semester:	<b>III</b>
Branch:	<b>Biotechnology</b>	Code:	<b>318351(18)</b>
Subject:	<b>Cellular and Molecular Biology</b>	Total Tutorial Periods:	<b>NIL</b>
Total Theory Periods:	<b>40</b>	Assignments:	<b>Two (Minimum)</b>
Class Tests:	<b>Two (Minimum)</b>	<b>Maximum Marks: 80</b>	<b>Minimum Marks: 28</b>
ESE Duration:	<b>Three Hours</b>		

## Course Objectives:

1. To explain about the concept of cell- its composition and function.
2. To impart knowledge about basics of cellular and molecular biology.
3. To integrate the dynamic discipline of modern cell biology in various fields like molecular biology, biochemistry, biophysics, microbiology, physiology, developmental biology, cytology and genetics.

**UNIT-I Introduction to cell, cell organelles, cell division, cell cycle and molecular biology:** Cell and Molecular Biology: Definitions, application & history Organization; Dynamics and functions of cellular membrane systems; Prokaryotes and Eukaryotes; Nucleus, mitochondria, chloroplasts, cytoskeleton; Introduction to Cell Cycle, mitosis and meiosis; Cellular activities and checkpoints; Regulation of stages of Interphase.

**UNIT-II Cell transport process and signaling:** Cell Membrane: Structure, membrane transport mechanisms; Molecular movements: In and out of Cells, types of diffusion: differences; Carbs, proteins & lipids. Cell Signals: Introduction, signal methodologies, receptors for cell signals, types of receptors; Agonists versus antagonists, binding and activation, constitutive activity; Signaling pathways- notch pathway.

**UNIT- III Genetic Foundations, Chromatin and Chromosome:** Mendelian and non-Mendelian inheritance; Transformation, transduction and conjugation; mutational analysis: Translocations, inversions, deletions, and duplications; Karyotypes, aneuploidy and polyploidy.

**UNIT-IV Genome maintenance and gene expression:** DNA replication; DNA modification; DNA damage and repair; Transcription, The genetic code, translation.

**UNIT-V Molecular methodology:** DNA cloning; Sequencing and analysis; Restriction maps; Nucleic acid blotting and hybridization.

## Text Books:

1. Cell and molecular biology (2003) S.C. Rastogi 2<sup>nd</sup> Edition, New Age International Pvt. Ltd. Publishers.
2. Biotechnology, B.D. Singh. Kalyani publication.

## Reference Books:

1. Concepts in molecular biology, Rastogi *et al.*
2. The cell- A molecular approach , G.N. Cooper
3. Cell biology , P.S. Verma and V.K. Agrawal
4. Cell & Molecular Biology “Concepts and Experiments”, G. Karp, John Wiley & sons.
5. Genome, T.A. Brown, John Wiley & sons.
6. Gene VIII , Benjamin Lewin
7. Molecular Biology, D. Freifelder, Jones Barat Lelt Publisher.

## Course Outcome:

1. The student will be able to understand the importance of studying structural and functional mechanism of cell.
2. The study of signaling pathways and genetic control mechanisms will help the students not only in Cellular and Molecular Biology but also r-DNA, Genomics, Proteomics, Cancer biology etc.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	<b>Bachelor of Engineering</b>	Semester:	<b>III</b>
Branch:	<b>Biotechnology</b>	Code:	<b>318352(18)</b>
Subject:	<b>Microbial Technology</b>	Total Tutorial Periods:	<b>NIL</b>
Total Theory Periods:	<b>40</b>	Assignments:	<b>Two (Minimum)</b>
Class Tests:	<b>Two (Minimum)</b>	<b>Maximum Marks: 80</b>	<b>Minimum Marks: 28</b>
ESE Duration:	<b>Three Hours</b>		

## Course Objectives:

1. To make the students familiar with the science of microbiology and its significance in everyday life.
2. To make the students well acquainted with basic principles of Microbiology.

**UNIT I Introduction and classification:** Course introduction, evolution of micro-organisms, habitat; **Classification and taxonomy and identification of the various microbes** (Methods in microbial ecology: Different approaches to identifying specific microorganisms and their function in microbial communities; Culturing; DNA-based methods, microscopy, radioisotopes and microelectrodes); **Classification of bacteria** and salient features according to Bergey's manual of determinative Bacteriology; Microbial diversity in different ecosystems (halophiles, mesophiles, thermophiles, acidophiles, alkalophiles, barophiles and other extremophiles); Structure and function of viruses, **classification of viruses**, replication of viruses, bacteriophages, plant viruses and animal viruses; **Classification of fungi** according to Alexopoulos and Mims, cell structure, specialized somatic structure; Reproduction in fungi, asexual, sexual and parasexual cycle, life cycles of fungi; **Structure and Classification of Algae**, ultrastructure and life histories of microalgae belonging to various algal classes, Cyanobacteria, Prochlorales and Cyanelles.

**UNIT II Morphology and growth:** Bacterial morphology, structure and characterization, cellular components of bacteria, sporulation and its mechanics; Autotrophs, heterotrophs; Growth and nutrition, nutritional requirements, enrichment culture, growth curve, kinetics of Growth, mathematical expression of exponential growth phase; Measurement of growth and growth yields, Batch Culture, Synchronous growth; Techniques of pure culture.

**UNIT III Microbial mechanisms: Microbial genetics** (control of gene expression at transcriptional and translational level, role of chromatin in gene expression and gene silencing, phages and viruses), **Physiology** (growth yield and characteristics strategies of cell division, stress response) microbial growth and reproduction, **Microbial pathogenesis** (Host parasite interaction recognition and entry process of different pathogens, molecular mechanism of infectious diseases).

**UNIT IV Microbes and their uses:** Bioremediation; Detoxification of inorganic and organic pollutants by microorganisms and challenges of microbiological degradation of recalcitrant pollutants, role of microorganisms in petroleum biodegradation, water purification, water treatment and bioremediation; Soil and plant microbial habitats and implications for use of legumes; Organic farming and biologic pest control; Animal-microbial symbiosis (ruminants and dairy farms as sources of methane production).

**UNIT V Industrial application:** Industrial and commercial applications of microorganisms; Climate control and detoxification of pollutants; Genetically modified microorganisms and their application in medicine, Industry and agriculture.

## Text Books:

1. Microbiology, Pelzar, Chan & Kreig (1986), Tata McGraw-Hill Education (2001)
2. Microbiology, Prescott, Harley & Klein (1986) Tata McGraw-Hill Education (2007)

## Reference Books:

1. Foundation of Microbiology (1999), K.P. Talaro & A. Talaro, 3<sup>rd</sup> Edition, W.C.B. McGrawHill
2. An Introduction to Microbiology, P. Tauro, K.K. Kapoor and K.S. Yadav
3. Microbiology and Biotechnology, D.P. Singh and S.K. Dwivedi, (2004) New Age International Pvt Ltd
4. Industrial Microbiology, L.E. Casida.
5. Introduction to soil and Agricultural Microbiology, G. Prabakaran.

## Course Outcome:

1. Practical aspect of the course brings awareness in the students during handling of the microorganisms in a much protected way so as to minimize the hazardous consequences.
2. The students will be able to utilize the knowledge of industrial application for welfare of the community and their betterment.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	<b>Bachelor of Engineering</b>	Semester:	<b>III</b>
Branch:	<b>Biotechnology</b>	Code:	<b>318353(18)</b>
Subject:	<b>Molecular Dynamics and Bioenergetics</b>		
Total Theory Periods:	<b>30</b>	Total Tutorial Periods:	<b>10</b>
Class Tests:	<b>Two (Minimum)</b>	Assignments:	<b>Two (Minimum)</b>
ESE Duration:	<b>Three Hours</b>	<b>Maximum Marks: 80</b>	<b>Minimum Marks: 28</b>

## Course Objectives:

1. To provide general understanding of molecular architecture of eukaryotic cells and organelles including membrane structure and dynamics so as to facilitate rigorous study of molecular mechanism in metabolism.
2. The objective of the course is to familiarize the students to the various chemical reactions occurring in one's own body and the other living organisms alike.

- UNIT I** Energy: energy flow cycle, energy conversion; High energy compounds; Structure and properties of ATP; Coupling reactions of ATP and NDP (nucleotide di phosphate); photosynthesis; Thermodynamic considerations.
- UNIT II** Biological membrane: structure, permeability, properties, passive transport and active transport, mechanism of Na<sup>+</sup>/ K<sup>+</sup>, glucose and amino acid transport, facilitated transport, energy requirement; Organization of transport activity in cell; Active potentials; Role of transport in signal transduction processes, signal transduction.
- UNIT III** Metabolism and bioenergetics; Generation and utilization of ATP; Metabolism of Nitrogen containing compounds: nitrogen fixation, amino acids and nucleotides.
- UNIT IV** Energetic of Metabolic Pathways; Energy Coupling (ATP & NADH); Stoichiometry and energetic analysis of Cell Growth and Product Formation, elemental Balances, degree of reduction concepts; available electron balances; Yield coefficients; Oxygen consumption and heat evolution in aerobic cultures; Thermodynamic efficiency of growth.
- UNIT V** Electron Flow as source of ATP Energy, site of Oxidative Phosphorylation, ATP synthetase; Electron transferring reactions: standard oxidation, electron Carrier, electron transport complexes, incomplete reduction of oxygen, mechanism of oxidative phosphorylation, oxidation of extra mitochondrial NADH, ATP yield and P: O Ratio; Role of electron transport energy; Respiratory Inhibitors; Regulatory control among Glycolysis; Citric acid cycle and oxidative phosphorylation.

## Text Books:

1. Introduction to Chemical Engineering thermodynamics, Smith and Vannes, Mcgraw Hill.
2. Chemical engineering thermodynamics, Y.V.C. Rao (New age international).

## Reference Books:

1. Engineering Thermodynamics, J.B.Hawkins, John Wiley Publication.
2. Engineering Thermodynamics, Spading and Cole (ELBS0).
3. Structural organization and dynamics of mitochondria in cell in vivo, Andry V kuznetsov, Wiley publication ltd.
4. Molecular system bioenergetics energy for life, Vandular Saks Wiley VCH publication.

## Course Outcome:

1. At the end of the course, students will have sufficient systematic and comprehensive knowledge about basic metabolism which will help them relate to the different Physiological processes taking place in the cell and how inanimate chemicals cause life.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	<b>Bachelor of Engineering</b>	Semester:	<b>III</b>
Branch:	<b>Biotechnology</b>	Code:	<b>318354(11)</b>
Subject:	<b>Phytochemistry</b>	Total Tutorial Periods:	<b>10</b>
Total Theory Periods:	<b>30</b>	Assignments:	<b>Two (Minimum)</b>
Class Tests:	<b>Two (Minimum)</b>	<b>Maximum Marks: 80</b>	<b>Minimum Marks: 28</b>
ESE Duration:	<b>Three Hours</b>		

## Course Objectives:

1. To make the students familiar and aware of constitution, classification, structure determination and isolation of compounds present in plants.
2. To make them learn about synthesis of drugs and use of different plants and chemical compounds to cure various diseases.
3. To make them learn about synthesis and application of important biomolecules like lipid, protein, vitamins etc.

- UNIT I** A study of plant constituents with reference to classification; Isolation and nomenclature of terpenes; Structure determination and identification general methods of structure elucidation of terpenes; Volatile oils: classification of citral and citronellol, menthol and camphor, Farnesol, Zinziberene.
- UNIT II** Alkaloids: Classification, isolation and general methods for structure investigation, structure elucidation of ephedrine and atropine; Nicotine, study of ephedra and cinchona; Structure of uric acid and caffeine. Tannins: general chemistry of tannins.
- UNIT III** Proteins: structure of proteins, partial and complete hydrolysis of polypeptides, determination of amino acid sequences; Study of gelatin, papain and hyaluronidase.
- UNIT IV** Lipids: General chemistry of lipids and classification, hydrolysis of fats; study of following drugs- castor, olive, coconut.
- UNIT V** Study of following drugs with reference to sources, preparation, constituents and uses: honey, Starches and dextrin. Vitamins: chemistry and structure determination of thiamine, riboflavin, ascorbic acid, vitamin A.

## Text Books:

1. Chemistry of Natural Products, P. S. Kalsi, Kalyani Publishers.
2. Organic Chemistry of Natural Products (Vol I & Vol II), Chatwal, Himalayan Publishers.

## Reference Books:

1. Synthetic Drugs, Chatwal, Himalayan Publishers.
2. Advance Practical Organic Chemistry, Jagmohan (Vol I & Vol II), Himalayan Publishers.
3. Text Book of Organic Chemistry, P. L. Soni, Sultan Chandra and Sons.
4. Text Book of Organic Chemistry, M. K. Jain, Sultan Chandra and Sons.

## Course Outcome:

1. The students will be able to gain knowledge about application of plants and their related compounds in treatment of various diseases.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	<b>Bachelor of Engineering</b>	Semester:	<b>III</b>
Branch:	<b>Biotechnology</b>	Code:	<b>318355(19)</b>
Subject:	<b>Stoichiometric Calculations</b>	Total Tutorial Periods:	<b>10</b>
Total Theory Periods:	<b>30</b>	Assignments:	<b>Two (Minimum)</b>
Class Tests:	<b>Two (Minimum)</b>	<b>Maximum Marks: 80</b>	<b>Minimum Marks: 28</b>
ESE Duration:	<b>Three Hours</b>		

## Course Objectives:

1. To enable the students to understand different types of laws of chemistry of materials and also prepare the students to accurately calculate the Stoichiometric relations between the materials involved in a physical and chemical reaction.

- UNIT I** Basic and derived units; Use of model units in calculations; Methods of expression; Compositions of mixture and solutions.
- UNIT II** Ideal and real gas laws; Gas constant; Calculations of pressure, volume and temperature using ideal gas law, use of partial pressure and pure component volume in gas calculations, applications of real gas relationship in gas calculation.
- UNIT III** Calculation of absolute humidity, molal humidity, relative humidity and percentage humidity, Use of humidity in condensation and drying, humidity chart, dew point, crystallization.
- UNIT IV** Combustion calculations; Fuel and flue gas analysis, Air fuel ratio; Theoretical oxygen requirement and percentage excess air, limiting and excess reactant.
- UNIT V** Energy Balance calculations; Thermo physics: Heat capacity calculations, Enthalpy changes of chemical and biochemical reactions.

## Text Books:

1. Stoichiometry, Bhatt and Vora, McGraw Hill Publications.
2. Chemical Process Principles Part – I Material and Energy Balance, Hougen and Watson, 2<sup>nd</sup> Edition, CBC Publishers.

## Reference Books:

1. Introduction to Stoichiometry, K. A Gavhane, 12<sup>th</sup> Edition, Nirali publication.
2. Basic Principles and Calculations in Chemical engineering, David M Himmelblau, 6<sup>th</sup> Edition, Prentice Hall.
3. Introduction to Chemical Engineering, Ghoshal, Sanyal, Datta, 5<sup>th</sup> Edition, TataMcgraw Hill.

## Course Outcome:

At the end of the course the students will have the values added to their knowledge like:

1. Students will develop a fundamental understanding of the basic principles of engineering processes and calculations. (Memory, comprehension)
2. Students will be able to examine and select pertinent data, and solve material and energy balance problems. (Application, analysis, synthesis)
3. Students will be able to select and/or evaluate problem solution methods, for example, between analytic and numerical solution techniques. (Synthesis, evaluation)

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	<b>Bachelor of Engineering</b>	Semester:	<b>III</b>
Branch:	<b>Biotechnology</b>	Code:	<b>318356(19)</b>
Subject:	<b>Instrumentation Techniques</b>		
Total Theory Periods:	<b>40</b>	Total Tutorial Periods:	<b>10</b>
Class Tests:	<b>Two (Minimum)</b>	Assignments:	<b>Two (Minimum)</b>
ESE Duration:	<b>Three Hours</b>	<b>Maximum Marks: 80</b>	<b>Minimum Marks: 28</b>

## Course Objectives:

1. To make the students learn how to accurately design a measuring system, collect necessary data, process and interpret the collected data, and accurately present the results.
2. To make the students understand the fundamentals of measuring systems include the particular limitations and capabilities of a number of specific measuring devices (pressure transducers, strain gages, thermocouples, etc.)

<b>UNIT I</b>	Principles of measurement: error analysis, static & dynamic characteristics of measurement; Dynamic response of I & II order instruments; Temperature measurement: expansion thermometers, thermocouples, resistance temperature detectors, thermistors & pyrometers and their calibrations.
<b>UNIT II</b>	Pressure measurement: Manometers, Bourdon tubes, Bellows; Measurement of gage pressure, vacuum; Measurement of absolute pressure; McLeod gage; Pirani gage; Ionization gage; Vacuum sensor, thermal vacuum sensor; Response of mechanical pressure gages; Strain Gages & LVDT.
<b>UNIT III</b>	Building blocks of an instrument: Classification, principals and applications of transducer & amplifier; Signal conditioner its isolation and signal transmitter; Display, data acquisition modules, I/O devices, Interfaces; Flow measurement: Head flow meters, area flow meters, open channel meters, positive displacement meters; Control valves – their characteristics.
<b>UNIT IV</b>	Liquid level measurement: Direct level measurement, Interface measurement, Hydrostatic head level measurement in pressure vessels, Ultrasonic level devices, Point & continuous level measurement using radioactive devices, Capacitance type devices, Resistance sensors, nuclear radiation type level gages & level switches.
<b>UNIT V</b>	Analytical instrumentation: Gas Chromatography; Operating principles, type, components & applications; High performance liquid chromatography, refractive index, pH, viscosity, density & conductivity measurement; Gas analyzers.

## Text Books:

1. Process Control Instrumentation Technology, (2005) Johnson C, 8<sup>th</sup> Edition, Prentice-Hall.
2. Industrial Instrumentation, (1975) Eckman D.P, McGraw Hill Publications.

## Reference Books:

1. Instrumentation, Measurement and Analysis, (2004) Nakra B.C. and Chaudhary K.K., 2<sup>nd</sup> Edition Tata- McGraw Hill.
2. Applied Instrumentation in the Process Industries, (1993) Andrew W. G. Vol. I, II & III Edition, Gulf Publications.

## Course Outcome:

1. The course will enhance and upgrade the knowledge of the students about the basic terminology used in measurements and instrumentation.
2. They will be able to identify and define the components of a measuring system.
3. Understanding of first and second order systems, thermocouples, RTDs, and thermistors, pressure transducers, strain gages, and flow meters will help them in applying them in further project related matters and also in making live models whenever possible.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**  
Branch: **Biotechnology**  
Subject: **Cellular and Molecular Biology Laboratory**  
Total Lab Periods: **36**  
Maximum Marks: **40**

Semester: **III**  
Code: **318361 (18)**  
Batch Size: **15**  
Minimum Marks: **20**

## List of Experiments: (At least Ten experiments are to be performed by each student)

1. Study of different type of cell and their organelles by chart model.
2. Study of cell division by chart model.
3. Study of cell division in Onion bud.
4. Study of leaf and stem structure of monocot and dicot by section cutting.
5. Measurement of cell size by micrometry.
6. Study of DNA, RNA and Genetic code by chart model.
7. Study of replication, transcription and translation by chart model.
8. Isolation of DNA from animal blood and plant cells
9. Determination of own blood typing.
10. R.B.C. and W.B.C. counting.

## **Equipments/Machines/Instruments/Tools/Software Required:**

- Charts of: Different type of cell and their organelles, Cell division, DNA, RNA, Genetic code, DNA replication, Transcription, Translation.
- Antisera A, B & D
- Ocular micrometer
- Stage micrometer
- Compound Microscope
- Hemocytometer
- Microscopic slide
- DNA isolation kit
- Different cell strainer
- Common lab instruments, chemicals and glassware.

## **Recommended books**

1. Cell & molecular biology “concepts and experiments”, G. Karp, John Wiley & sons.
2. Refer Books mentioned in theory syllabus



# Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**  
Branch: **Biotechnology**  
Subject: **Microbial Technology Lab**  
Total Lab Periods: **36**  
Maximum Marks: **40**

Semester: **III**  
Code: **318362 (18)**  
Batch Size: **15**  
**20**

## List of Experiments: (At least Ten experiments are to be performed by each student)

1. General precautions and safety measures in Microbiology Lab.
2. Study of working principle of Microscope / Laminar flow/ Autoclave.
3. Preparation of Culture Media.
4. Isolation of microorganisms from soil.
5. Isolation of microorganisms from air.
6. Isolation of microorganisms from water.
7. Pure culture isolation techniques.
8. Gram staining of bacteria.
9. Simple staining using acidic/basic stains
10. Staining of fungal cell and Identification.
11. Antibiotic sensitivity test.
12. Standard analysis of drinking water.
13. Determination of optimum temperature for growth
14. Determination of thermal death temperature and thermal death time
15. Effect of pH on growth of bacteria

## **Equipments/Machines/Instruments/Tools/Software Required:**

- Autoclave
- Hot Air Oven
- Laminar Air Flow
- Microscope
- Water Bath
- Colony Counter
- Digital Balance
- Rotating Incubator
- BOD Incubator
- Distillation Unit

## **Recommended books:**

1. Experiments in Microbiology, Plant Pathology and Biotechnology, K. R. Aneja, New Age International
2. Practical Microbiology- Principles and Techniques Vinita Kale and Kishore Bhusari.
3. Refer Books mentioned in theory syllabus

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**

Branch: **Biotechnology**

Subject: **Phytochemistry Lab**

Total Lab Periods: **36**

Maximum Marks: **40**

Semester: **III**

Code: **318363 (18)**

Batch Size: **15**

Minimum Marks: **20**

## List of Experiments: (At least Ten experiments are to be performed by each student)

1. Extraction of caffeine from tea leaves.
2. Extraction of Cystein from human hair.
3. Separation of amino acids by chromatography.
4. Separation of dyes by chromatography.
5. Separation of dyes stuffs by chromatography.
6. Identification of functional group in given organic compound (carboxylic acid, amide, phenolic).
7. Identification of given organic compound (acetamide, benzamide, urea).
8. Identification of given organic compound (glucose, fructose, sucrose and starch).
9. Identification of given organic compound (phenol, resorcinol, alpha-naphthol, beta- naphthol).
10. Identification of functional group in given organic compound (carbohydrate, aldehyde and ketone).
11. Preparation of oxalic acid from sucrose (cane sugar) by oxidation with conc. HNO<sub>3</sub>.
12. Preparation of p-bromoacetanilide from acetanilide (bromination).
13. Preparation of m-dinitrobenzene from nitrobenzene (nitration).
14. Preparation of acetylsalicylic acid from salicylic acid (acetylation).

## **Equipments/Machines/Instruments/Tools/Software Required:**

- Electric water bath
- Thin layer chromatographic apparatus
- Paper chromatographic apparatus
- Column chromatographic apparatus
- Digital balance
- Hot plate
- Electric oven
- Magnetic stirrer
- Soxlet extraction apparatus

## **Recommended Books:**

1. Advance Practical Organic Chemistry, Jagmohan (Vol I & Vol II), Himalayan Publishers.
2. Organic Chemistry of Natural Products (Vol I & Vol II) Chatwal, Himalayan Publishers.
3. Refer books mentioned in theory.

# Chhattisgarh Swami Vivekanand Technical University, Bilai

Name of program: **Bachelor of Engineering**

Branch: **Biotechnology**

Subject: **Instrumentation Techniques Lab**

Total Lab Periods: **36**

Maximum Marks: **40**

Semester: **III**

Code: **318364 (19)**

Batch Size: **15**

Minimum Marks: **20**

## List of Experiments: (At least Ten experiments are to be performed by each student)

1. Determination of the % composition of unknown liquid using Abbe Refractometer.
2. Determination of the TDS value of the given sample using TDS Meter.
3. Determination of the specific conductance of given liquid using Digital Direct Reading Conductivity meter.
4. Determination of TDS, Temperature, Conductivity, ORP, D.O. of water sample by portable water analyser kit.
5. Determination of acid - base characteristics of given sample using digital pH Meter.
6. Determination of the % composition of given solution by photoelectric colorimeter.
7. Determination of the % composition of given solution by UV-VIS spectrophotometer.
8. To detect the presence of alkali metals in the given solution using flame photometer.
9. Determination of turbidity of given sample using Nephelo-turbidity meter.
10. Measurement of temperature of hot surface using thermocouple.
11. Determination of wavelength at which given liquid shows maximum absorbance using UV-VIS spectrophotometer.

## **Equipments/Machines/Instruments/Tools/Software Required:**

- Abbe Refractometer Colorimeter
- TDS Meter
- Conductivity meter
- Water analysis kit.
- pH Meter.
- Photoelectric
- UV-VIS. Spectrophotometer
- Flame Photometer
- Nephelo-Turbidity meter
- thermocouple

## **Recommended Books**

1. Process Control Instrumentation Technology, (2005) Johnson C, 8<sup>th</sup> Edition Prentice-Hall.
2. Industrial Instrumentation, (1975) Eckman D.P, McGraw Hill Publications.
3. Instrumentation, Measurement and Analysis, (2004) Nakra B.C. and Chaudhary K.K, 2<sup>nd</sup> Edition, Tata-McGraw Hill.
4. Applied Instrumentation in the Process Industries, Vol. I, II & III (1993), Andrew W. G. Edition, Gulf Publication.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	<b>Bachelor of Engineering</b>	Semester:	<b>III</b>
Branch:	<b>Biotechnology</b>	Code:	<b>318365 (46)</b>
Subject:	<b>Value Education</b>	Total Tutorial Periods:	<b>NIL</b>
No. Of Periods:	<b>2 Periods/Week</b>	<b>Minimum Marks:</b>	<b>24</b>
<b>Maximum Marks:</b>	<b>40</b>		

## Course Objectives:

1. This course is designed to provide the importance of education with why, what & how.
2. To impart students with an understanding of fundamental humanitarian viewpoint and its outcomes.
3. To provide the knowledge about whole existence and its impact on values.
4. To bring the awareness about life long exercise so that they can fulfill their responsibility towards themselves, the family, the society, the planet.

**UNIT-I Aim of Education and Necessity for Value Education:** Education in values/wisdom/etc and education in traits/technologies/etc as the two fundamental strands of education; Answer to the frequently asked questions such as “Why to do studies”, “What studies to do in overall”, “How to do studies in a proper way”, “How to think systematically and talk systematically”

**UNIT-II Humanitarian Viewpoint and Basic Human Objective:** Meaning and concept of happiness, Need for a fundamental viewpoint to judge things in all cases of human concerns, Proposal of the natural path of humanitarian coexistentialism; Consciousness development and its expression; Fundamental want of sustainable happiness in human being; Understanding the distinct activities and needs of self (I) and body in human being; Fundamental goal of human being; Sustainable-solution in individual (At the place of delusion); Sustainable-prosperity in family (At the place of poverty); Sustainable-cooperation in society (At the place of competition); Sustainable-coexistence in planet (At the place of struggle)

**UNIT-III Elements of Holistic and Systematic Perspective:** Need for study of fundamental information categories to develop holistic perspective; Particular-time actions and general-time laws; Need for fundamental information sequence to develop systematic perspective, Some examples for systematic study sequence

**UNIT-IV Elements of Society-friendly and Environment-friendly Goals:** Elements of Knowledge of whole existence; Elements of Knowledge of human being; Elements of fundamental Values and Wisdom; Value spectrum with reference to general relationships and particular relationships of the objects in nature; Elements of History and Contemporarity used to set current goals; Elements of Sciences and Techniques to formulate methods to achieve goals; Elements of Motoricity and Mattericity to make actions to execute the methods

**UNIT-V Lifelong Exercise for All-round Sustainability:** Collecting information for sustainability issues; Motivating people towards sustainable life-style; Ability to identify and develop appropriate technologies and management patterns for society-friendly and environment-friendly systems for production /protection/ utilization/ experimentation ; Ability to establish and execute the fundamental five-fold system in order to ensure sustainable peace-and-prosperity worldwide.

## Text Books:

Value Education for Consciousness Development by Dr P B Deshmukh, Radha K Iyer, and Deepak K Kaushik (2<sup>nd</sup> Edition, 2012, ISBN: 978-81-924034-0-3)

## Reference Books:

1. International Research Handbook on Values Education and Student Wellbeing by Terence Lovat, Ron Toomey, Neville Clement (Eds.), Springer 2010, ISBN: 978-90481-86747
2. Values Education and Lifelong Learning: Principles, Policies, Programmes by David N Aspin and Judith D Chapman (Eds.); Springer 2007, ISBN: 978-1-4020-6183-7
3. Fundamentals of Ethics for Scientists and Engineers by E G Seebaur and Robert L Berry, 2000, Oxford University Press